Appl. No. 10/652,325
Atty. Docket No. 9506
Amdt. Dated 06/27/2005
Reply to Office Action of 04/27/2005
Customer No. 27752

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of controlling tension in a moving web material, the method comprising steps of:

a) determining a modulus-of-elasticity-analog value of the moving web material,

b) determining a web-tension-analog value of the moving web material,

c) determining a web-tension error signal for the moving web,

d) determining a web-velocity-analog value for the moving web,

b) e) adjusting a control system gain according to the modulus-of-elasticity-analog value of the moving web material, and

f) adjusting an integral gain of the controller according to the web-velocity-analog value,

g) adjusting a system output according to the web-tension-error signal and the integral gain of the controller, and

c) h) adjusting a speed of a web drive according to the control system gain.

2. (Original) The method according to claim 1 wherein the control system gain is a proportional gain.

3. (Cancelled)

4. (Original) The method according to claim 1 wherein the web drive which has a speed adjusted according to the control system gain is selected from the group consisting of: an upstream drive, a downstream drive, and combinations thereof.

5. (Original) The method according to claim 1 wherein the moving web material comprises a paper web.

6. (Original) A method of adjusting an output in a process for handling a moving web material, the method comprising the steps of:

a) determining an error signal,

b) determining a web-velocity-analog value,

c) determining an instantaneous integral gain according to the web-velocity-analog value,

d) determining a modulus-of-elasticity-analog value,

e) determining an instantaneous proportional gain according to the modulus-of-elasticity-analog value, and

f) adjusting the output according to the error signal, the instantaneous integral gain and the instantaneous proportional gain.

7. (Original) The method according to claim 6 wherein the step of determining a modulus-of-elasticity-analog value comprises steps of:

a) determining a first web-tension-analog value of the moving web material in a first span,

b) determining a first web-velocity-analog value of the moving web material in the first span,

c) determining a second web-tension-analog value of the moving web material in a second span,

d) determining a second web-velocity-analog value of the moving web material in the second span, and

e) determining the modulus-of-elasticity-analog value of the moving web material according to the first web-tension-analog value, the second web-tension-analog value, the first web-velocity-analog value, and the second web-velocity-analog value.

8. (Original) A method of controlling a process for handling a material having a web-velocity-analog value, and a web-tension-analog value, the method comprising the steps of:

a) determining a tension set-point value,

b) determining the web-tension-analog value,

c) determining a tension error,

d) determining the web-velocity-analog value,

e) determining an instantaneous integral gain according to the web-velocity-analog value,

f) determining a modulus-of-elasticity-analog value,

g) determining an instantaneous proportional gain according to the modulus-of-elasticity-analog value, and

h) adjusting the output according to the tension error, the instantaneous proportional gain, and the instantaneous integral gain.

9. (Original) The method according to claim 8 wherein the step of determining a modulus-of-elasticity-analog value comprises steps of:

a) determining a first web-tension-analog value of the moving web material in a first span,

b) determining a first web-velocity-analog value of the moving web material in the first span,

c) determining a second web-tension-analog value of the moving web material in a second span,

d) determining a second web-velocity-analog value of the moving web material in the second span, and

e) determining the modulus-of-elasticity-analog value of the moving web material according to the first web-tension-analog value, the second web-tension-analog value, the first web-velocity-analog value, and the second web-velocity-analog value.

10. (Original) The method of claim 8 wherein the step of determining the instantaneous integral gain according to the web-velocity-analog value further comprises the steps of:

a) determining a predetermined velocity;

b) determining an integral gain for the predetermined velocity; and

c) determining the instantaneous integral gain according to the web-velocity-analog value and the predetermined velocity, and the integral gain for the predetermined velocity.

11. (Original) The method of claim 8 wherein the step of determining the instantaneous integral gain according to the web-velocity-analog value further comprises the step of:

a) determining the instantaneous integral gain according to the web-velocity-analog value and a length of a span of the process.

12. (Original) The method of claim 8, further comprising the steps of:

a) determining a lower limit modulus of elasticity;

b) determining an upper limit instantaneous proportional gain for the lower limit modulus of elasticity; and

c) setting the value of the instantaneous proportional gain equal to the upper limit instantaneous proportional gain if the determined modulus-of-elasticity-analog value is less than or equal to the lower limit modulus of elasticity.

13. (Original) The method of claim 8, further comprising the steps of:

a) determining an upper limit modulus of elasticity;

b) determining a lower limit instantaneous proportional gain for the upper limit modulus of elasticity; and

c) setting the value of the instantaneous proportional gain equal to the lower limit instantaneous proportional gain if the determined modulus-of-elasticity-analog value is greater than or equal to the upper limit modulus of elasticity.

14. (Original) The method of claim 8 further comprising the step of adjusting the output according to a speed draw setting.

15. (Original) The method of claim 8 further comprising the step of adjusting the speed of a drive selected from the group consisting of: an upstream drive, a downstream drive, and combinations thereof.

16. (Original) The method of claim 8 further comprising the step of selecting an auxiliary gain.

17. (Original) The method of claim 8 wherein the material comprises a paper web material.

18. (Cancelled)

19. (Currently amended) A method of controlling tension in a moving paper web material, the method comprising steps of:

a) determining a first web-tension-analog value of the moving web material in a first span,

b) determining a first web-velocity-analog value of the moving web material in the first span,

c) determining a second web-tension-analog value of the moving web material in a second span,

d) determining a second web-velocity-analog value of the moving web material in the second span,

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e) determining the modulus-of-elasticity-analog value of the moving web material according to the first web-tension-analog value, the second web-tension-analog value, the first web-velocity-analog value, and the second web-velocity-analog value,

f) adjusting a control system gain according to the modulus-of-elasticity-analog value of the moving web material, ~~and~~

g) adjusting the control system gain according to the first web-velocity-analog value and the second web-velocity-analog value, and,

~~g)~~ h) adjusting a speed of a web drive according to the control system gain.